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MEMORANDUM FOR RECORD

16 September 1954

SUBJECT: Meeting of Upper Atmosphere Rocket Research Panel

1. At the invitation of Air Force Scientific Advisory Board, I attended a meeting of the Upper Atmosphere Rocket Research Panel on 8 September at the Naval Research Laboratory, Anacostia. The two agenda items of primary concern were: 1) Higher Altitude and Satellite Vehicles, 2) International Geophysical Year, and the logistics therefor.

2. This panel was formed in 1948 by representatives of various organizations which were concerned with upper atmosphere research through rocketry. It is chaired by Dr. James A. Van Allen who is Chairman of the Department of Physics, State University of Iowa. The panel has representation from Aberdeen Proving Grounds, University of Michigan, Evans Signal Laboratory, General Electric Company, Naval Research Laboratory, Air Force Cambridge Research Center, California Institute of Technology, and Harvard Observatory. It has no official connection with any Department of Defense organization but is informally supported by the Office of Naval Research. In connection with the forthcoming International Geophysical Year, it has been assigned the function of developing the United States program for upper atmosphere research through the use of high altitude rockets.

3. At the 8 September meeting, there were in addition to the panel itself, representatives from the Chief of Ordnance, United States Army, the Redstone Arsenal, The Rand Corporation, the Office of Naval Research, Aerophysics Development Corporation, Air Force ARDC, NACA, National Science Foundation, etc.

4. Dr. Van Allen opened the discussion of the first agenda item - High Altitude and Satellite Vehicles - by a discussion of past upper atmosphere research with rockets. He cited the extensive use of V-2s which could carry 2,000 pounds payload to a 100 miles altitude but the supply of which has now been exhausted. He mentioned the WAC-Corporal which was not used as a single stage vehicle, primarily because it could carry only 25 pounds to an altitude of 40 miles. The WAC-Corporal was however, used as the second stage in combination with the V-2 and achieved an altitude of 250 miles. Since exhaustion of the V-2 supply, two other rockets have been developed and used as civilian research instruments. These are the Viking which in its present form can carry 100 pounds payload to 135 miles

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altitude and in its forthcoming modification will carry 500 pounds to 195 miles altitude. The second rocket is the Aerobee which can carry 150 pounds payload to 65 miles altitude. In addition to these two, there is also the ROCKOON which is a system of launching a Deacon rocket from a "Skyhook" balloon. The launch is made at a balloon altitude of approximately 100,000 feet and the rocket carries 30 pounds of instrumentation to an altitude of 60 miles. Dr. Van Allen concluded his presentation by stating that, from here on, civilian upper atmosphere rocket research will probably be dependent, due to lack of civilian funds, upon the military rockets being developed now by the Department of Defense. He then introduced Dr. Fred Whipple of the Harvard Observatory for a discussion of Earth Satellite Vehicle (ESV).

5. Dr. Whipple stated that the interests of civilian research and of the Department of Defense in ESV are synonymous. He pointed out the main scientific gains which could be made through the ESV which have application both to civilian science and to defense. These include meteorology, astronomy, solar-terrestrial relations, for ultra-violet and X-ray research, etc. He described the ESV sequence as being in three phases as follows:

(1) The placing in orbit of an observable object (uninstrumented) which could be seen either optically or by radar.

(2) The placing in orbit of an instrumented vehicle, "an unmanned physical laboratory". This phase will be a progressive development starting with a very small vehicle similar to the Singer MOUSE, which will carry telemetering equipment. Larger capacity will be achieved as bigger and more reliable power plants are developed. These latter will probably be nuclear or solar energy plants. Instrumentation starting with simple telemetering will progress through more complicated stages until television and finally a telescope is included. The last stage in this phase will be a remote controlled vehicle.

(3) The final phase of ESV will be the putting in orbit of a manned satellite vehicle.

6. Dr. Whipple emphasized that the placing of a slug in orbit was in itself the first step in the process. He stated that such a vehicle even without instrumentation could produce useful scientific results such as air density data and relative positions on the earth. The main problem in connection with a slug (phase I) is that of observation from the earth, which will require much study. This problem will be simplified if the ESV is on either an equatorial or a polar orbit. In regard to

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the unmanned instrumented vehicle (Phase 2), he said that the main problems will be development of small reliable power plants; television, the technical design of which is already well along; orientation of the vehicle itself and of the instrumentation carried; and constant reduction of weight of the equipment to be carried. He stated that the altitude at which the vehicle should orbit will depend upon the purpose envisaged. Theoretically, an altitude of 1,[illegible] miles at a speed of 5 miles per second would be ideal. This would provide a 2-hour orbit.

7. [illegible] of the Air Branch, [illegible], made the next presentation, concerning high altitude vehicle projects with which [illegible] is concerned. [illegible] has three main projects in this field, the first of which is the development of a manned conventional aircraft to operate at a maximum altitude of 300 miles. Two designs are presently under consideration - the Douglas 553 and the Douglas [illegible]. The former is designed to have an altitude of 700,000 feet. (Note: this field of study is covered in Report [illegible], "High Altitude and High Speed Study" by Douglas Aircraft Corporation. [illegible]). The second [illegible] project is development of a manned high altitude balloon to operate at 100 to [illegible] feet. The system would be based on the "Skyhook" polyethylene balloon carrying a gondola equipped to sustain one or two men. The [illegible] project is for manned space flight and the study of this is being conducted at the Aero Jet Laboratory. The first phase of this latter project is called [illegible], the purpose of which is to place an [illegible] in orbit at an altitude of 200 miles in order to secure meteorological and atmospheric data at that level as the first step toward higher altitude work. Project [illegible] has been tentatively approved by the Navy and [illegible] is going ahead with it in cooperation with the Army. It is now also being coordinated with the Air Force at a very high level. The project calls for the use of the Army Redstone missile (see para. 8 below) as the first stage with the Loki cluster (see para. 9 below) providing the second and third stages. Under Aero Jet leadership, four subsidiary studies are planned to be undertaken as follows:

(1) A [illegible] Study to determine the size and weight of the vehicle required at an altitude of [illegible]00 miles. It is hoped that Dr. Fred Whipple will be the leader of this.

(2) An Orbital Study to determine the power required, the guidance system, etc. It is hoped that Dr. S. Fred Singer of the University of Maryland will lead this.

(3) A [illegible]-trajectory Study to determine the final design and the staging requirements.





(4) A launching study to determine where and how the vehicle should be launched, the logistics requirements, and the range risks involved.

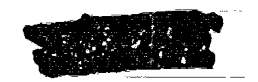
Following the completion of these four studies, construction of the actual vehicle will be commenced. [illegible] considers that successful completion of Project [illegible] will lead into the launching of a vehicle similar to the [illegible] [illegible], i.e., an instrumented vehicle using a polar orbit at an altitude of 200 miles. It is expected that [illegible] would remain aloft for ten days while [illegible] could probably maintain its orbit for about one month. [illegible] however emphasized that if adequate backing is available for Project [illegible], [illegible] might well be used during the International Geophysical Year. [illegible] laid great stress on the necessity for the United States being the first in launching an [illegible] and said that Project [illegible] was absolutely essential to achieve this end.

8. [illegible] of Redstone Arsenal then gave a briefing on the Redstone [illegible]. [illegible], as a tactical weapon, has a range of [illegible] miles with a trajectory apex of [illegible] miles. If used as a research tool, it has a vertical range of [illegible] miles with a [illegible] of about [illegible] pounds. The modified [illegible] which is now under development will have a vertical range of 270 miles with an instrument weight allowance of [illegible] pounds. Redstone Arsenal is now tooling up for production of these missiles as research instruments. They will cost 70,000 to [illegible],000 per missile if more than five per month are produced. They have a speed of approximately Mach [illegible].

9. [illegible] of [illegible] Development Corporation described [illegible] which they are developing as an air [illegible] project. The vehicle comprises two clusters of [illegible] rockets; the first cluster of seven acting as the first stage booster, the second cluster of four constituting the second stage. It has a speed of Mach 10 and a payload of 10 pounds. Air-launched vertically from an altitude of [illegible] feet, it is designed to achieve an altitude of [illegible] miles. It is planned to use either a flashing light system or a folding radar reflector for tracking purposes. [illegible], it is expected to get an altitude of [illegible] miles. [illegible], the second stage develops [illegible]. The missile has yet to be flown vertically as a research instrument. [illegible] indicated that the second stage cluster could be adapted to carry 12 pounds of ruggedized telemetering equipment.

10. [illegible] commented briefly on a design which they are [illegible] which consists of the [illegible] booster as the first stage and a [illegible] rocket as the second stage. It is estimated that this vehicle could attain an altitude of [illegible],000 feet. It would be very low cost, in the range of [illegible]7,000 to [illegible],000.

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11. Dr. [illegible] of the National Science Foundation gave a brief account of [illegible] of [illegible] funds for upper atmosphere rocket research. Two million, three-hundred thousand dollars is presently available and about 7[illegible] of this will be transferred immediately to [illegible] for procurement and accounting purposes. The balance of the rocket project funds - [illegible]00,000 - will become available next year.

12. Following adjournment of the panel meeting, I spent a couple of hours with Dr. Van Allen, who had served under me for a time during World War II. Van Allen was one of the key figures in the development of the VT fuse under Admiral Parsons and was one of the officers assigned to introduce the fuse to the Pacific Fleet. In our conversation, I mentioned the difficulty that apparently would be encountered in the [illegible] program, of designing scientific equipment which would stand the high G's encountered in most high altitude rockets, particularly with solid propellant. I mentioned specifically the [illegible] G's envisioned in stage two of the [illegible] cluster vehicle. Dr. Van Allen said that there should be no such difficulty. He pointed out that the VT fuse contained five miniature radio tubes, a battery and a transmitter, and that this instrument, with practically no failures, withstood 20,000 G's when fired from the naval [illegible] gun. He pointed out also that in the [illegible] which has been in use for some time, the [illegible] carries [illegible] pounds of instrumentation for cosmic ray research [illegible] 60 G's. He said that he saw no difficulty whatsoever in designing instrumentation for high altitude rockets which would easily withstand 1,[illegible] G's. In regard to the [illegible] generally, he agreed thoroughly with Lt. Cdr. [illegible], that the immediate first step was to launch a slug. He felt that if top level government priority could be established, with guidance and control by an outside high level scientific group, it would almost certainly be possible to put a slug in orbit by the time of the IGY and possibly even put up an instrumented vehicle.

P. G. STRONG

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Distribution:
Orig 1 - [illegible] Collection
1 - Dr. [illegible]
1 - [illegible]
1 - [illegible]
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